ENGINEERING ANALYSIS

Source Name: King and Queen Sanitary Landfill Facility Registration No.: ***40937-11***

Source Location: King and Queen County County Plant ID No.: 097-00017

Date: ***December 14, 2012*** ***Permit Writer's Initials: HLL***

I. Introduction and Background

A. Company Background

(Note: The write up for the prior permit action has been retained for clarity purposes and all new information has been bolded and italicized in the document.)

The King and Queen Sanitary Landfill (K&QSLF) is located in rural King and Queen County in an area that is currently in attainment for all pollutants. K&QSLF received an SOP permit to construct and operate a landfill on February 24, 1999 and the April 28, 2004 NSR permit allowed construction of two 3,000 scfm open flares **(PCD-01 and PCD-02**). ***However, only one flare was installed***, **PCD-01**. The May 26, 2010 NSR permit amendment allowed for the flexibility to operate the one large enclosed flare (6,000 scfm – PCD-03) or the open flare (3,000 scfm – PCD-01) at any time, but not simultaneously.. ***The facility is now proposing in a permit application dated June 29, 2010 and received on July 2, 2010 to operate the existing 6,000 scfm enclosed flare (PCD-03) at its full capacity which had been restricted by the May 2010 permit and to remove the permitted 3,000 scfm open flare (PCD-01) in CY 2028 and replace it with a 4,500 scfm enclosed flare (PCD-04). In addition, the facility has requested to add up to eight (8) solar powered flares for odor control, 400 scfm total (Email November14, 2012 request to increase to 400 scfm total).***

B. Proposed Project Summary

The facility has requested to increase the currently permitted 6,000 scfm enclosed flare's (PCD-03) capacity from 1,944,720,000 scfm/yr to 3,153,600,000 scfm/yr as well as operating the currently permitted 3,000 scfm open flare (PCD-01) up to an annual capacity of 886,161,600 scfm/yr simultaneously. The facility also requested that a 4500 scfm enclosed flare (PCD-04) planned to be installed in CY 2028 be permitted at this time. Since this flare is not projected to be needed for another 16 years and that during this time that there could be so many future changes involving BACT, state/federal regulations and even facility operations as well as the difficulty in meeting the 18 month construction requirements in Article 6, that it doesn't seem prudent to permit it at this time.

The facility sends most of the Landfill Gas to a Landfill Gas to energy plant (INGENCO) and has installed a 6000 scfm enclosed flare and only one of the two 3000 scfm open flares previously permitted.

The facility has requested to add up to eight (8) solar powered flares. These flares burn fugitive LFG for odor control. The sole purpose of including them in the permit is to account for total flare emissions and to demonstrate that the facility total emissions are estimated to be below 250 TPY each for all pollutants, thus not PSD applicable at this time.

C. Process and Equipment Description

A new table was inserted per the boilerplate:

Equipment to be constructed				
Reference No.	**Equipment Description**	**Rated Capacity**	**Federal Requirements**	**Permit Date**
SF1-SF8	Up to Eight (8) Solar Flares	(1.5 Million BTU/Hr) =<400 scfm Total	-	TBD, 2012
Equipment to be Modified				
P01	Municipal Solid Waste Landfill	GCCS (56.19 million Mega-grams) 61,940,000 cubic yards	40 CFR 60, subpart WWW 40 CFR 63 Subpart AAAA	May 26, 2010
PCD-01	Open Flare System (LFG Specialties, Inc.)	(90 Million BTU/Hr) 3,000 scfm maximum	40 CFR 60, subpart WWW 40 CFR 63 Subpart AAAA	May 26, 2010
PCD-03	Enclosed Flare System (John Zink)	(180 Million BTU/Hr) 6,000 scfm maximum	40 CFR 60, subpart WWW 40 CFR 63 Subpart AAAA	May 26, 2010

(9 VAC 80-1180 D 3)

D. Project Schedule

Date application received in PRO: ***July 2, 2010***
Date application deemed complete: ***November 14, 2012***
Proposed construction commencement date: ***Upon permit issuance***
Proposed start-up date: ***Upon permit issuance***

II. Emissions Calculations (see attached spreadsheets)

This permit limits the facility to *248.5 TPY of CO and 64.5 TPY NOx after full operation of the large enclosed flare, limited operation of the existing open flare along with the new odor control flares. Therefore, this facility has requested that its flare emissions be limited to 248.5 TPY for CO, an increase from the 97.2 TPY in the May 26, 2010 permit. The following table list the facility's proposed permitted limits:

Table 1-D Proposed Permit Limits

Flare	NO_x		CO		PM/PM10/PM2.5		$*SO_2$		*NMOC		*VOC	
	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
6000 scfm Enclosed Flare	10.8	47.3	36.0	157.7	3.0	13.4	2.8	12.1	1.0	4.3	0.4	1.7
3000 scfm Open Flares	6.1	15.1	33.3	82.0	1.5	3.7	1.4	3.4	0.5	1.3	0.2	0.5
400 scfm Total Solar Flares**	0.06	2.1	0.25	8.8	0.025	0.8	0.025	0.8	0.005	0.3	0.04	0.1
Facility Total	17.0	64.5	69.6	248.5	4.8	18.1	4.2	16.3	1.5	5.8	0.6	2.3

*** Estimated SO2, NMOC and VOC corrected for installed open flare.**

***** Include in total flare emissions.***

Article 6 Fugitive Emissions

The LANDGEM model was also revised to use AP-42 factors. This estimate results in fugitive dust (PM and PM10) emissions of 100.7 TPY from the landfill and fugitive NMOC emissions of 109.5 TPY. These fugitives are included in Article 6 applicability (9VAC5-80-1100. Applicability).

"D. The fugitive emissions of a stationary source, to the extent quantifiable, shall be included in determining whether it is subject to this article. The provisions of this article do not apply to a stationary source or modification that would be subject to this article only if fugitive emissions, to the extent quantifiable, are considered in calculating the uncontrolled emission rate of the source or net emissions increase."

PSD Fugitive Emissions

These fugitive emissions are not required to be used in evaluating the source for "Major Source" status because the facility is not one of the twenty-eight listed facility types per 9 VAC 5-80-1615.

"c. The fugitive emissions of a stationary source shall not be included in determining for any of the purposes of this article whether it is a major stationary source, unless the source belongs to one of the following categories of stationary sources:"

Emission Factors

CO emission factors for both flares were taken from vendor guarantees. The NOx emission factor for the open flare was taken from vendor guarantees since it was slightly higher than the AP-42 factor. The attached spreadsheet shows the emission calculations for each flare and planned combinations though calendar year (CY) 2028.

The facility has requested to increase the currently permitted 6,000 scfm enclosed flare's (PCD-03) capacity from 1,944,720,000 scfm/yr to 3,153,600,000 scfm/yr as well as operating the currently permitted 3,000 scfm open flare (PCD-01) up to an annual capacity of 886,161,600 scfm/yr simultaneously. ***Emissions have been calculated based on a maximum LFG flow of 4,039,762,000 per year for combined open and enclosed flares.***

Emissions have been calculated for the odor control solar flares (L09) operating on fugitive LFG 8760 hours each (up to 400 scfm total). This total was used to add to the emissions for both the open and enclosed flares to set limits for all pollutants to below 250 TPY, thus avoiding PSD applicability.

The chart in the next section shows the maximum emissions calculated on the attached spreadsheets for each flare and the total Net Emissions Increase for the facility.

The facility consists of units that have uncontrolled annual emissions which exceeded most all permitting levels and thus requires a permit for all criteria pollutants. The proposed estimated emissions for all operating scenarios supplied in the application were included in the DEQ spreadsheet to determine the summary of emissions limits needed to determine if the facility could avoid Article 8 major source permitting. The table below shows that the facility requires a state major source permit based on proposed emission limits.

GHG Emissions

Greenhouse Gas Rule: EPA's Greenhouse Gas Rule (GHG) is in place and after January 1, 2011, major sources that have a net emission increase of over 75,000 tons of CO2 equivalents [CO2e = CO2, methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6)], must apply BACT to GHG emissions, only if another pollutant also shows a significant net increase. After July 1, 2011, new sources that have the potential to emit 100,000 tons or more of CO2e and modified sources with a net emission increase of CO2e over 75,000 tons year will be required to obtain a PSD permit. The total CO2 e is based on taking the mass emissions of each GHG pollutant and multiplying by its Global Warming Potential (GWP). These GWP factors are as follows: CO2: 1; CH4: 21; N20: 310; SF6: 23,900; HFCs: 140 to over 11,700; and PFCs: 5,210 to 9,200. The first three GHG pollutants are primarily from fuel burning and the latter pollutants are from semi-conductor and other production processes.

The GHG estimated emissions were calculated by the source using emission factors from 40 CFR 98, Table C2 and global warming potential (GWP) ratios from 40 CFR 98, Table A1. The results for each set of flares and the flare totals are found in the next section (see attached applicant letter on estimated GHG).

III. Regulatory Review

The permit allows the existing 3,000 scfm open flare (PCD-01) to operate at a reduced annual rate and combined with the unrestricted operation of the 6,000 scfm enclosed flare (PCD-03) are fully capable of consuming all projected landfill gas from the GCCS until sometime in CY 2028 based on projected LFG production.

This facility has the potential to emit approximately 808.02 tons of CO2e (Excluding biomass deferral) in CY 2050, 591.47 tons of CO2e in CY 2028 (with existing flares) and so is considered a minor source <100,000 tons/yr) has been subject to reporting requirements (estimated >25,000 tons which includes all CO2 emissions). The source is not a major source for GHG based on CO2e estimated emissions and is applicable to a biomass deferral based on flares burning LFG (*Maximum CO2 e for all LFG from CEC letter dated 10/12/2012).

The BACT, State Major and PSD applicability are in the tables below:

Table 1-A **Article 6/BACT Applicability**

Flare 3,000 scfm (PCD-01)

Pollutant	New Uncontrolled Emissions (TPY)	Current Uncontrolled Emissions (TPY)	Net Emissions Increase (TPY)	Article 6 Exemption Level (TPY)	BACT Level Exceeded (Y/N)?
$PM/PM_{10}/PM_{2.5}$	3.7	6.7	-3.0	15/10/6	N/N/N
SO_2	3.4	6.0	-2.6	10	N
NO_X	15.1	23.7	-8.6	10	N
CO	82.0	59.1	22.9	100	N
VOC	0.5	1.0	-0.5	10	N

Flare 6,000 scfm (PCD-03)

Pollutant	New Uncontrolled Emissions (TPY)	Current Uncontrolled Emissions (TPY)	Net Emissions Increase (TPY)	Article 6 Exemption Level (TPY)	BACT Level Exceeded (Y/N)?
$PM/PM_{10}/PM_{2.5}$	13.4	8.3	5.1	15/10/6	N/N/N
SO_2	12.1	7.4	4.7	10	N
NO_X	47.3	29.2	18.1	10	Y
CO	157.7	97.2	60.5	100	N
VOC	1.7	1.0	0.7	10	N

Solar Flares 400 scfm total (L09)

Pollutant	New Uncontrolled Emissions (TPY)	Current Uncontrolled Emissions (TPY)	Net Emissions Increase (TPY)	Exemption Level (TPY)	Exemption Level Exceeded (Y/N)?
$PM/PM_{10}/PM_{2.5}$	0.8	0	0.8	15/10/6	N/N/N
SO_2	0.8	0	0.8	10	N
NO_X	2.1	0	2.1	10	N
CO	8.8	0	8.8	100	N
VOC	0.1	0	0.1	10	N

Facility Wide (Article 6 Permitting)

Pollutant	New Uncontrolled Emissions (TPY)	Current Uncontrolled Emissions (TPY)	Net Emissions Increase (TPY)	Exemption Level (TPY)	Exemption Level Exceeded (Y/N)?
$PM/PM_{10}/PM_{2.5}$	118.8	109.0	9.8	15/10/6	N/N/Y
SO_2	16.3	7.4	8.9	10	N
NO_X	64.5	29.2	35.3	10	Y
CO	248.5	97.2	151.3	100	Y
VOC	2.3	1.0	1.3	10	N

Fugitive Dust at 100.7 TPY added to PM/PM10 NUE and CUE.

<u>Article 6 State Major Applicability – Net Emissions Increase</u>

While "state major" source is not defined as such in the current Regulations, it is used to mean a new source of criteria pollutants with a potential to emit that is 100 tpy or more, but that does not qualify as a PSD source or a non-attainment major source OR a modification to a minor source with a <u>Net Emissions Increase</u> of 100 tpy or more for criteria pollutants but that does not qualify as a PSD source or a non-attainment major source.

As with determining whether an Article 6 permit is required for the proposed project, similar two items must be occurring (1) there is a physical change in operation occurring and (2) the <u>Net Emissions Increase</u> exceeds 100 tpy for any criteria pollutant for applicability to state major source requirements.

Below is the <u>Net Emissions Increase</u> analysis for state major source applicability:
(Note: NUE is the proposed combined permitted emissions for flares, L09 (Solar Flares), PCD-01 and PCD-03, while CUE is the currently combined permitted emissions for flares PCD-01 and PCD-03).

Table 1-B **State Major Applicability**

Facility (State Major)

Pollutant	New Emissions (TPY)	Current Emissions (TPY)	Net Emissions Increase (TPY)	State Major/ Significant Level (TPY)	State Major Level Exceeded (Y/N)?
PM/PM_{10}	18.1	6.3	11.8	100/15	N/N
SO_2	16.3	7.4	8.9	100/40	N/N
NO_X	64.5	29.2	35.3	100/40	N/N
CO	248.5	97.2	151.3	100/100	Y/Y
VOC	2.3	1.0	1.3	100/25	N/N

Article 8 Applicability – Net Emissions Increase

In order to be subject to Article 8 modification applicability, the facility must first be an existing major stationary source to begin with. Since this facility's permitted emissions after the proposed project will be below 250 tpy and is not one of the 100 tpy sources considered to be major, then the facility is not considered to be a PSD major source and Article 8 major modification does not apply.

Table 1-C **PSD Applicability**

Facility Wide

Pollutant	New Emissions (TPY)	PSD Level (TPY)	PSD Level Exceeded (Y/N)?
PM*	18.1	250	N
PM_{10*}	18.1	250	N
SO_2	16.3	250	N
NO_X	64.5	250	N
CO	248.5	250	N
VOC	2.3	250	N
GHG CO2 e	808.0*	75,000	N

***Maximum CO2 e for all LFG (From CEC letter dated 10/12/2012).**

The total emissions for the proposed option is above the modified and reconstructed source exemption levels pollutants listed in 9 VAC 5-80-1320D. The total flare estimated GHG (CO2e) 808.0 TPY, which is below the permitting threshold of 75,000 TPY CO2e in 9 VAC 5-85-10 (Greenhouse Gas Tailoring) in any case. The applicant estimated HAP emissions for the flares and they are below the exemption levels.

The proposed project is a modification because there is a physical change that results in a net increase in emissions for NOx and CO; which are estimated at 35.3 TPY NOx and 151.3 TPY CO. The enclosed flare (PSD-03) and the open flare (PCD-01) are considered presumptive BACT for NOx and CO at an NSPS WWW landfill based on "Good Combustion Practices." These flare function as backup to the landfil gas to energy plant (INGENCO)

The proposed changes at the facility are subject to Article 6 permitting since the Net Emissions Increase for NOx and CO exceed Article 6 modification exemption levels. The proposed changes also subject the facility to state major modification requirements, but do not cause the facility to be subject to PSD permitting applicability. After the proposed permit is issued, the facility will be required to submit a Title V permit application within one year due to the permitted CO emissions exceeding 100 tpy.

Due to its size, the K&QSLF is subject to NSPS WWW and MACT AAAA (as of 1/24/2004). The proposed project is subject to 40 CFR 60 NSPS Subpart WWW and 40 CFR 63 NESHAP Subpart AAAA requirements.

New guidance items concerning fuel sampling and laboratory analysis were evaluated and were not considered applicable (Facility has proposed to use method 3C for net heating value in the GCCS Design Plan approved September 21, 2012). Permits issued in CY 2012 should be evaluated to include the following (not applicable in this case): "Samples taken as required by the permit shall be analyzed in accordance with 1 VAC 30-45, Certification for Noncommercial Environmental Laboratories, or 1 VAC 30-46, Accreditation for Commercial Environmental Laboratories."

A. Criteria Pollutants

Since the permitted increase for CO emissions exceeds the modeling threshold levels, the Central Office modeling staff was consulted and they agreed no criteria pollutant modeling needed to be performed (Email dated October 26, 2012).

B. Toxic Pollutants

MACT AAAA applies to the landfill (requires semi-annual reporting of NSPS WWW monitoring); therefore no new evaluation or modeling of HAPs are required.

C. Control Technology

Since the Net Emissions Increase for NOx emissions from the PCD-03 enclosed flare exceed Article 6 modification levels, then that flare is subject to BACT for NOx emissions. BACT for this would be 'good combustion practices" and is listed in NSPS WWW as an acceptable NMOC control device. The PCD-01 flare is not subject to BACT since the Net Emissions Increase for the criteria emissions were below Article 6 modification levels. The landfill is now 40 CFR 60, NSPS Subpart WWW applicable and must control emissions of NMOC. The facility has chosen to treat the landfill gas prior to shipment to the INGENCO facility or as a backup provided by up to one enclosed and one open flare. The existing open flare should respond better to the expected LFG part loads.

IV. Initial Compliance Determination (including references)

A. Stack Testing

Stack testing for the enclosed flare as required in 40 CFR 60, NSPS Subpart WWW and by 40 CFR 60.18 was included in the previous permit.

B. VEE

Part of the testing required by 60.18 is a Method 22 for visible emissions. This was included in the previous permit.

V. Continuing Compliance Determination

A. CEMS

None are currently required.

B. Recordkeeping

The facility will still be required to measure the flow of LFG to the equipment and to keep all records required by NSPS WWW and MACT AAAA (SSM Reporting).

C. Further Testing

None required.

VI. Public Participation

Since the proposed project triggers state major modification, then the facility is subject to a 30 day public comment period AND a public hearing according to 9 VAC 5-80-1170 requirements.

VII. Other Considerations

A. File Consistency Review

Previously issued landfill air permits from Republic (BFI) facilities were used as a boilerplate for this action and to update permit language.

B. PRO Policy Consistency Review

First the facility will have to update their Title V permit application within one year. Second, by June 1, 2013 (180 days after permit issuance), the facility will have to submit a revised Gas Collection and Control System (GCCS) Design Plan report or Letter addendum consistent with this NSR permit for additional flare emissions and the required Title V application.

C. *Confidentiality*

No information was requested by the facility to be held as confidential business information.

D. Permit History

The following is a recent permitting history of the facility:

October 26, 2010 – Minor permit for the two existing flares.
January 23, 2009 – Minor permit for existing flares.
July 21, 2005 – Title V Renewal.

E. Application Fee Receipt:

None (NA). Application in house prior to fee regulations being effective.

VIII. Recommendations

Based on the information submitted, it is recommended that this permit be issued. Recommendations and limitations are provided in the draft permit letter.

Regional Engineer:

Date:

Reviewing Engineer:

Date:

Attachments: ***Permit application***
New Open Flare and Enclosed Flare Calculation sheets
GHG calculation letter dated October 12, 2011
Solar Flare application dated June 18, 2012 (and Email November14, 2012)
Modeling Email dated October 26, 2012